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7 Monitoring Equipment

General Information

Component Description

Audio distribution amplifiers are solid-state signal amplification devices designed for professional audio applications in broadcast and closed circuit television installations. They provide audio monitoring as well as high-quality output of both balanced stereo and mono audio signals. They are essentially maintenance-free and do not require periodic adjustment or calibration. Several amplifiers can receive the same input signal source, and can provide output signals to many different kinds of audio broadcast needs.

Video distribution amplifiers serve much the same purpose as do audio distribution amplifiers. They provide multiple, high-quality video output signals to support broadcast and closed-circuit television applications. Operational controls can include gain and phase. Phase adjustment allows the care full timing of color channels, and avoids having to change cable lengths when new equipment is installed.

In addition, audio monitors are devices that can provide an audio signal monitoring or signal strength measurement on many input sources. These sources can be selected, and can be stereo or monaural signals. The signals can be amplified, placed on internal or external speaker systems, or can be sent on to other types of audio equipment, such as recorders."

Terms

TERM	DEFINITION
AC	Alternating Current
AES/EBU	An audio interface specification for digital pulse-code-modulated signals that permits direct connection to audio equipment that support the AES/EBU interface
AFC	Automatic Frequency Control
AGC	Automatic Gain Control
Ampere (amp)	The unit of measure of current flow. One ampere equals 1 coulomb of electrons passing a given point in 1 second.
Amplifier	An electronic device that increases the strength of an electrical impulse with respect to the impulse's frequency.
Analog Signal	A signal transmitted on a continuously varying electromagnetic wave
ASCII	American Standard Code for Information Interchange
Attenuation	A term used to measure the decrease in magnitude in transmission from one point to another. It may be expressed as a ratio or in decibels.
Attenuator	An adjustable transducer for reducing the amplitude of a wave without introducing appreciable distortion.

TERM	DEFINITION
Band-Pass Filter	A filter allowing only frequencies within a certain range to continue, while blocking lower and higher range frequencies
Bandwidth	The range of frequencies occupied by a signal or passed by a transmission channel (7.5 KHz or 15 KHz).
Baseband Frequencies	The band of frequencies containing the information prior to modulation or subsequent to demodulation.
Baud	The number of discrete signal-state changes (signal events) per second; often equivalent to bits per second
BNC	A cable connector type
Broadcast	To distribute a program or signal to a ground-based audience.
Carrier	The radio frequency wave that is modulated by the baseband information signal.
Closed-Circuit Television	Television limited to monitors connected by cabling
Composite Baseband	The raw demodulator output, prior to filtering. Contains all transmitted subcarriers.
Connector	A socket, jack, or port on a piece of equipment into which a cable or wire connects.
Current	The flow or rate of flow of electrons in a conductor from a point of higher concentration to one of lower concentration. Usually measured and expressed in amperes.
DC	Direct Current
Decibel (db)	A unit for measuring the volume of a sound.
Demodulation	The recovery of baseband information from a modulated carrier.
Deviation	The level of modulation of an FM signal.
Digital Data	Data formed by rapidly sampling the voltage of an analog signal and converting the samples into binary numbers
Digital Data Compression	A method for reducing digital signal information by eliminating redundant or unnecessary digital data
DIP	Dual Inline Processing
Frequency	The number of complete oscillations per second of an electromagnetic wave. 1 cycle per second = 1 hertz (Hz) 1,000 cycles per second = 1 Kilohertz (KHz) 1,000,000 cycles per second = 1 Megahertz (MHz) 1,000,000,000 cycles per second = 1 Gigahertz (GHz)
Frequency Modulation (FM)	The baseband signal is caused to vary by the frequency of the carrier wave.
Hertz (Hz)	The unit of frequency, one cycle per second.
High-Pass Filter	A filter allowing high frequencies to continue, while blocking low frequencies
IF	Intermediate Frequency. A commercial, industrial-standard frequency, 70 MHz
Impedance	An Electrical property which is equal to the ratio of voltage to current flow
K-Band	The frequency spectrum from 10.9 to 36 GHz.

TERM	DEFINITION
Knob	A round handle that can be turned.
Ku-Band	RF signal frequencies in the range, 10.95 - 12.75 GHz
L-Band	RF signal frequencies in the range, 950 to 1700 MHz
LED	Light Emitting Diode
Low-Pass Filter	A filter allowing low frequencies to continue, while blocking high frequencies
Megahertz (MHz)	1 million hertz.
MPEG	Moving Picture Experts Group
MUSICAM	An MPEG Layer 2 audio decompressor
Noise Source	Any signal that interferes with the desired signal
NTSC	National Television Standards Committee
Ohm (Ω)	The unit of electrical resistance present in a circuit.
Outlet	A wall 110V or 220V AC electrical source or a terminal strip 110V AC source.
PAL	Phase Alteration by Line. A German video transmission standard
Pick-up Probe	An electronic sensing device that converts RF electromagnetic signal into a varying electric current at the input to the Low-Noise Block Downconverter (LNB)
PLL	Phase-Locked Loop
RF	Radio frequency
SECAM	Séquence Couleur a Mémoire, Color Sequence with Memory. A French video transmission standard
Signal Splitter	A device used to divide a broadband signal into different frequency ranges for different receivers
Signal/Noise Ratio	The ratio, usually expressed in decibels, of the strength of a desired signal to that of the extraneous noise that is present.
Sparkles	A popular term for video noise seen as very small flashes of light on a monitor or television screen.
Subcarrier	An information carrying wave, which in turn modulates the main carrier in a communications system. Subcarriers are used for independent audio and data transmission.
Switch	A lever or button that can be moved from one position to another.
Terminal	A socket jack, or port on a piece of equipment into which a cable connects.
Transducer	A device by means of which energy can flow from one or more transmission systems or media to one or more other transmission systems or media. The energy transmitted by these systems or media may be of any form (electric, mechanical, or acoustical), and it may be of the same form or different forms in various input and output systems or media.
Transmit	To send out radio or television signals by electromagnetic waves
TVRO	Television Receive Only
Uninterruptable Power Supply (UPS)	A backup source of electrical power that begins providing electrical power to a system whenever that system's primary source of electrical power is interrupted or halted.
VCR	Video Cassette Recorder
Volt (v)	The unit of measure for potential difference.

TERM	DEFINITION
Volt-Ampere (VA)	Unit of apparent power equal to the product of voltage and current.

CENTRAL DYNAMICS Model 821 Audio Distribution Amplifier

Features

The Central Dynamics Model 821 Audio Distribution Amplifier is a solid-state device designed for professional audio applications in broadcast and closed-circuit television installations. The unit is self-contained in a metal case, including the power supply.

The 821 amplifier is a true differential, high-impedance input, low-noise and low-distortion amplifier providing both balanced and unbalanced 600 ohm input and outputs. It can be connected either as a balanced 600 ohm 1 x 6 distribution amplifier, or as an unbalanced 300 ohm 1 x 12 distribution amplifier.

The 821 Amplifier design incorporates complementary power output amplifiers with redundancy to make sure of reliable operation. Full power output of each amplifier module is specified to +24 dBm.

Individual amplifier modules have the following dimensions:

- Height: 5.12 inches (13.2 cm);
- Width: 1.6 inches (3.9 cm); and
- Depth: 9.6 inches (24.1 cm).

The amplifier modules are compatible with the Model 800 series main-frame, which is a standard 5.2 by 19 inch (13.3 by 48.3 cm) rackmount assembly. This rackmount assembly can contain up to ten 800 Series Modules (such as the 821 Audio Amplifier) in any combination. Each of the ten housings of the rackmount assembly provides its amplifier module with two connectors on the rear panel. The top connector connects inputs, outputs, and controls to its specific module through BNC or terminal block connectors. The bottom connector distributes AC power to all modules in the rackmount assembly.

Specifications for the Model 821 Audio Distribution Amplifier are given in Table 7.1.

TABLE 7.1, MODEL 821 SPECIFICATIONS

PARAMETER	VALUE
INPUT:	
Type	Balanced or Unbalanced (600 ohm rear panel terminating)
Impedance	Capacitive Coupled, 150K Resistive
Level	-20 to +24 dBm
OUTPUT:	
Number	6 balanced, 12 unbalanced
Gain	±6 dB (gain control)

PARAMETER	VALUE
Type	Resistive build-out
DC Level	±50 mV
Headroom	+26 dBm before clipping, @ 117 VAC line
Module Isolation	60 dBm
PERFORMANCE:	
Frequency Response	±0.15 dBm (20 Hz to 20 KHz)
THD	< 0.01%
IMD	< 0.01%
Noise & Hum	> -80 dBm referenced to 0 dBm (>100 dBm @ Maximum Output)
CMR	60 dBm Minimum, @ 60Hz
POWER REQUIREMENT:	
Input	117VAC 10% 50-60Hz 220VAC 10% 50-60Hz
Power Rating	7 W
ENVIRONMENTAL:	
Temperature	0 to +50 ºC
Humidity	0 to 95%

Operations

The Model 821 is essentially an adjustment-free amplifier. It provides LED indicators for power-on, a replaceable ½A fuse, test points, and integrated circuit IC sockets for ease of servicing. The Model 821 is a maintenance-free unit and does not require periodic adjustment or calibration. Only one potentiometer is provided internally for trimming the Common-Mode-Rejection (CMR). This potentiometer should not be adjusted unless an active component in the unit has been replaced.

If the amplifier should fail or show unusual performance, remove it from the rackmount assembly for separate testing. Refer to the schematic drawings in the Central Dynamics Model 821 Reference Manual for detailed instructions.

Visually inspect the unit first for obvious failures or defects, such as a blown fuse or burned components. If no visual defect is found, the module has to be tested. Equipment needed to perform these tests include:

- Oscilloscope (Tektronix 465 or equivalent);
- Digital Volt Meter; and
- Function Generator or Tone Generator.

To perform the necessary tests, follow the steps below:

1. Check the power supply DC voltages. A nominal ±38 to ±42 VDC is expected at a 117 VAC line with **NO** audio signal input.
2. Check the output of the operational amplifiers for zero (0) volts with no signal input.
3. Check the "swinging" power supply transistors. The base voltage of each transistor should be about 38% (±14 to ±16 VDC) of the power supply ramp.
4. Check the output DC level that should be ±50 mV maximum. The VBE multiplier should bias the output transistors at approximately 0.6 VDC, base-emitter.

If excessive cross-over distortion is found, generally one of the push-pull transistors is malfunctioning.

Following general troubleshooting procedures for isolating defective components should result in minimum time off-line.

All parts are usually available from local electronic supply houses. However, care should be exercised in selecting replacement parts to make sure of equal performance. Refer to the parts lists in the *Central Dynamics Model 821 Reference Manual* for performance specifications of replacement parts.

CENTRAL DYNAMICS Model 805 Video Distribution Amplifier

The Central Dynamics Model 805 Video Distribution Amplifier is a solid-state amplifier designed specifically for use in broadcast and high-quality closed-circuit television systems. It is self-contained in a metal case 5.2 inches high, by 9.6 inches deep, by 1.6 inches wide (13.2 cm high, by 24.1 cm deep, by 3.9 cm wide).

Features

Six separate, isolated outputs are provided. These outputs are each capable of delivering a 1.4 volt peak-to-peak video signal into a 75 ohm load. The input is high impedance and loop-through. All inputs and outputs are made through BNC connectors.

Test points for input and output signals, light-emitting diode (LED) indicators for power supply voltages, and operational controls are located on the front panel of the module. The only operational controls are amplifier gain and phase.

The Model 805 Video Distribution Amplifier has its own power supply. It can be used in combination with other 800-series modules in the Model 800 FR-10 or the Model 800 FR-3 rackmount frame (such as the Model 821 Audio Distribution Amplifier). Each module in the rackmount frame has its own electrical fuse and three-wire AC power cord to minimize the hazard of electrical shocks.

The Model 800 FR-10 is a standard frame with the dimensions 5.2 inches high by 19 inches wide (13.3 cm by 48.3 cm). It can hold any combination of up to ten modules. Each of the ten locations has two connectors. The top connector connects the input and output signals to the rear panel of the module. The bottom connector is for AC power and is wired the same for all modules. The rear panel assembly mounts to the back of the frame with two screws. The smaller, Model 800 FR-3 frame is similar to the FR-10, but it provides locations for up to three 800-series modules.

Specifications for the Model 805 Video Distribution Amplifier are given in the Table 7.2.

TABLE 7.2, MODEL 805 SPECIFICATIONS

PARAMETER	VALUE
INPUT SIGNAL	
Level	0.5 to 1.25V p-p nominal
Impedance	50K ohm bridging (minimum)
Return Loss	40 dB (minimum) to 4.43 MHz
OUTPUT SIGNAL	
Number	6
Level	1.4V p-p full performance
Impedance	75 ohm ±1%

PARAMETER	VALUE
Output Isolation	36 dB (minimum) to 4.43 MHz
Module Isolation	60 dB (minimum) to 4.43 MHz
PERFORMANCE	
Frequency Response	+0.1, -0.25 dB to 10 MHz
Differential Gain	0.2% maximum
Differential Phase	0.2º maximum
Gain	-3 dB to +6 dB
Tilt	1% maximum
Signal-to-Noise Ratio	60 dB (minimum) signal to RMS noise
POWER REQUIREMENTS	115 VAC 10% 50-60 Hz 230 VAC 10% 50-60 Hz
ENVIRONMENTAL	
Full Performance	0 to 50 ºC

Operations

The Model 805 is designed for the minimum of necessary adjustments. Only amplifier gain and phase shift are adjustable on the front panel of the amplifier. The phase shift adjustment is included to allow amplifiers that are replaced in carefully timed color video systems to be phased without cutting new delay cables. Two current-protected LEDs on the front panel provide an indication of the operation of both the +8 VDC and-8 VDC internal power supplies.

If the Model 805 should show unusual performance or fail to operate, there are a number of tests that you can perform before contacting your system administrator. To perform these tests, you must have the following test equipment:

- Voltmeter Simpson 260 or equal;
- Oscilloscope Tektronix 465 or equal;
- Vectorscope Tektronix 520A or equal;
- Test Set Tektronix 144 or equal; and
- Sweep Generator Key 154C or equal.

Perform the following tests.

Gain

Check the gains of the 2 channels of the oscilloscope to make sure that their individual gains are the same.

1. Terminate 5 of the 6 outputs with 75 ohm loads.
2. Plug in the AC power cord for the module.
3. Measure the +8V and –8V of the power supply outputs with a voltmeter.
4. Measured voltages should be +8 (±0.5) VDC and –8 (±0.5) VDC.
5. Connect a 1V peak to peak staircase or ramp video signal to the input.
6. Connect the sixth output to one channel of the oscilloscope and terminate at the oscilloscope with 75 ohms.
7. Loop the input test signal through the amplifier and terminate at the other channel of the oscilloscope with 75 ohms.
8. Overlay the input and output signals.
9. Adjust the module's GAIN control until the output is the same level as the input.

Frequency Response

1. Connect the sweep generator to the amplifier input.
2. Make the same connections as you did in the GAIN test setup.
3. With a 1V peak to peak sweep signal input from the sweep generator, adjust C15 and C6 for maximum flatness of the signal displayed on the oscilloscope.

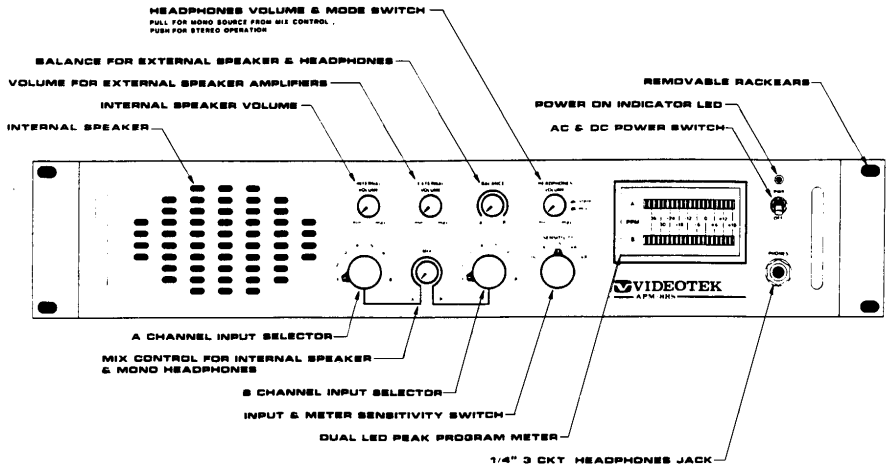
Phase

1. Connect the amplifier input to the test set.
2. Remove one of the 75 ohm output terminations and connect this output to a vectorscope.
3. Terminate the output at the vectorscope with a 75 ohm termination.
4. Connect the subcarrier from the test set to the proper BNC connector on the back of the vectorscope and terminated.
5. Insert a 1V peak to peak ramp signal from the test set.
6. Adjust the vectorscope gain and calibrate the amplifier unit.
7. Measure the differential gain. It should be 0.2% or less.
8. Measure differential phase. It should be 0.2º or less.

VIDEOTEK APM-8RS Audio Monitor

The APM-8RS is an audio monitoring device that is capable of monitoring and metering any two of eight possible input signals. Figure 7.1 shows the front panel of the audio monitor.

Figure 7.1, APM-8RS Front Panel View



Features

The inputs can be either high or low impedance, balanced or unbalanced. Two input selector switches (A & B) can choose any of the eight inputs, thereby allowing monaural monitoring of a single source or dual monitoring of a stereo source. A five-position input sensitivity switch allows a wide range of input levels.

Following the selection of input sources and sensitivity level setting, the signals proceed on to the amplifiers and meters. In addition, the signals are passed on to A & B high impedance outputs for use by external amplifiers or other equipment. There are two external speaker amplifiers that are controlled by a separate volume control. The A & B signals can be mixed for use by the internal speaker, which has its own amplifier and volume control.

The APM-8RS has a stereo headphone jack that is driven by separate amplifiers and volume control. The headphone can monitor the A & B signals as a stereo source, or it can be switched to monitor the mixed signal as a monaural source.

Dual peak program LED bargraph meters monitor the A & B signals. The multicolor display allows the identification of a signal level even at a distance from the meter. The meter has over 50 decibels (dB) of range in 3 dB steps. The level of the signal that is applied to the input connector can be determined by taking the meter reading and adding the sensitivity switch setting. For example, the level of a signal that reads +12 dB on the meter and has a sensitivity switch setting of +4 dB is 12 + 4 = +16 dBm input.

The APM-8RS operates from either a 115 VAC or a 230 VAC source. Selection of the AC source is made by a switch on the rear panel of the audio monitor. In addition, the APM-8RS can operate on a 12 VDC source. The DC can be the only power source, or it can be connected as a standby source in the event of a power failure. If both AC and DC power sources are connected, the unit operates from the AC source. It automatically switches to the DC source if the AC source fails.

The APM-8RS has an internal, calibrated –5dBm 600 ohm tone source. The frequency of the tone source is not controlled, but usually occurs around 800 Hertz (Hz). This output of this source may be connected to any of the eight inputs to the APN-8RS, and can be used for complete system calibration tests.

Operations

APM-8RS Specifications

Table 7.3 summarizes the technical specifications of the APM-8RS audio monitor:

TABLE 7.3, APM-8RS SPECIFICATIONS

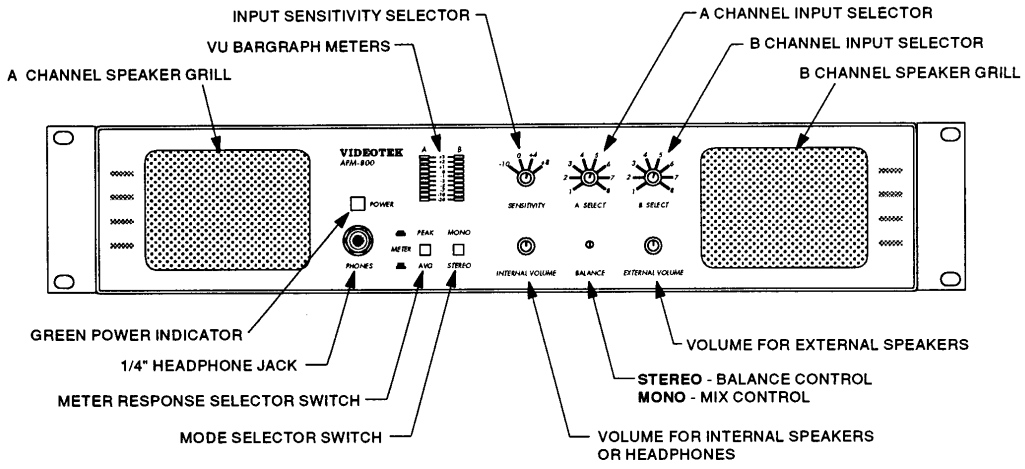
PARAMETER	VALUE
Inputs	Eight inputs; barrier strip connections for balanced or unbalanced; switchable 600ohm termination on each input
Input Switching	Dual channel A & B; either can select any of the eight inputs
Input Sensitivity	Switchable attenuation for –16, -8, -5, +4, or +8 dBm for indication of zero (0 dBm) on bargraph peak program meters
PPM Bargraph Meters	Dual A & B peak program LED meters. Twenty 3 dB segments in three colors for quick level identification
Meter Response	Accuracy: ±0.5 dB above –24 dB of scale Frequency: ±0.5 dB, 20 Hz to 14 KHz ±1 dB, up to 30KHz
Line Outputs	High impedance; barrier strip unbalanced outputs for A & B channels. Level is –7 dB of meter scale
Mix Function	For internal speaker and headphones; can be adjusted to vary from A to (A&B) to B selected inputs
Internal Speaker	3 x 5 inch, 8 ohm; driven with separate 1.5 watt amplifier and volume control. Source: Mix function
Headphone Output	Located on front panel ¼ inch, 3-circuit jack; separate volume control and amplifiers; can monitor either the monaural mix function or stereo A & B inputs

PARAMETER	VALUE
External Speaker Outputs	Two 9 watt bridge outputs on barrier strip, for speakers from 8 to 16 ohm. These amplifiers have balance and volume control
External Speaker Output Specifications	Total Harmonic Distortion: Below 1% Hum and Noise: Less than 7 mV Frequency Response: ±2 dB, 20Hz to 20 KHz
Calibrated Tone Output	Approximately 800 Hz, -5 dBm into 600 ohms; floating output may be connected either balanced or unbalanced at barrier strip output.
Temperature Range	Operating: 0 ºC to +50 ºC Storage: -40 ºC to +65 ºC
AC Power Requirements	115/230 VAC switchable ±10%, 50/60 Hz; 50 W average; 85 W peak
DC Power Requirements	12 to 18 VDC; 3 amperes maximum
Dimensions	Height: 3.5 inch (8.9 cm) Width: 17 inch (43.2 cm), plus 2 inch removable rack mounting brackets Depth: 15 inch (38.0 cm), including knobs and connectors
Weight	14 lbs.(6.4 kg)

VIDEOTEK APM-800 Stereo Audio Monitor

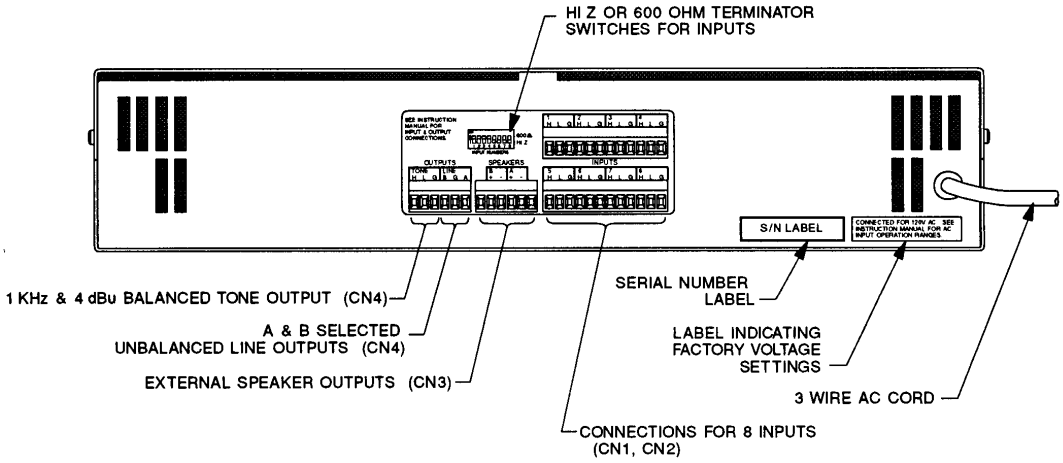
The Videotek APM-800 Stereo Audio Monitor has been designed for dual aural monitoring of up to eight inputs. The APM-800 has two color bargraph meters, internal speakers, a headphone jack, and external speaker amplifiers. The APM-800 has switches for peak or average meter response, stereo or mono operation, A and B selectors for 8 inputs, front input sensitivity selection, and controls for internal volume, balance, and external volume. Magnetic shielding allows for the use of the APM-800 next to waveform or picture monitors without causing interference or distortion. The APM-800 is suited for use in remote vans, editing suites, VTR monitor bridges, or for any system that requires monitoring of multiple signals. Figures 7.2 and 7.3 show the front and rear panel views of the APM-800 monitor.

Figure 7.2, APM-800 Front View



APM-800 FRONT PANEL

Figure 7.3, APM-800 Rear View



APM-800 BACK PANEL

Features

A summary of the features of the APM-800 includes:

- Input and output connectors that are detachable screw-type, allowing easy installation to any system.
- Eight inputs; each may be connected balanced or unbalanced; separate switchable 600 ohm terminations.
- Both the “A” and “B” channel input selectors can select any of the 8 inputs. This allows versatility of operation; for example, 2 separate monaural inputs, stereo inputs, stereo reverse, or both channels receiving the same input for mono operation.
- Front panel input sensitivity selector has 4 ranges: -10, 0, +4, and +8 dBu (unreferenced) inputs for 0 dB indication on the meters.
- Meter responses (ballistics) are switchable between peak program and average, and they are calibrated to VU scale.
- A and B channel bargraph meters feature 10-segment, 2-color LED displays for easy visual level monitoring.
- Stereo-mono switch (neither this switch nor the balance control affects the signal meter reading).

- Balance control in stereo mode and mix control in mono mode, control the headphones, and the internal and external speakers.
- Internal volume control, speakers, and their amplifiers provide adequate monitoring, even in a noisy environment.
- 3 circuit, ¼ inch stereo headphone jack cuts out internal speakers when plugged in. It uses the internal volume control to set listening level.
- The external volume control and two 15-watt peak amplifiers provide ample sound when connected to a pair of external high fidelity speakers.
- A tone source provides a balanced 1 kHz output at +4 dBu on rear connectors.
- Internal fuses and jumper cables provide for world-wide selection of source voltage.
- Rack mounting brackets may be removed for table-top use of the APM-800.
- Front panel green LED power indicator.

Specifications for the APM-800 monitor are given in Table 7.4.

Table 7.4, APM-800 Specifications

PARAMETER	VALUE
Inputs	8 inputs; balanced or unbalanced sources; switchable 600 ohm terminations
Maximum input level	AC: +12 dB over sensitivity range DC: ±6 VDC
Input switching	Dual channel A and B. Either channel can select any of the 8 inputs.
Input sensitivity ranges	Switchable selector for –10, 0, +4, and +8 dBu for 0 dB indication on meters and outputs
Line Outputs	A and B high impedance outputs, follow input and sensitivity switching
Bargraph meters	A and B LED display; switchable peak program and average response ballistics; calibrated in standard VU scale.
Meter frequency response	±1 dB, 30 Hz to 30 KHz @ 25 ºC
Meter accuracy	±0.5 dB @ 0 dB meter reading @ 25 ºC
Tone output	1 KHz ± 5%, +4 dBu, THD ≥ 1.5% @ 25 °C. 600 ohm balanced output
Internal speakers	Two 3-inch full range; A and B from separate amplifiers; SPL of 100 dB at 2 ft. with 1 watt per channel applied

PARAMETER	VALUE
Internal speaker frequency response	300 Hz to 12 kHz
Headphone jack output	Front panel ¼ inch, 3 circuit jack; output Max. is 260 mV rms into 8 ohms; volume and balance control; jack interrupts internal speakers
External speaker amplifiers	A & B amplifiers with rear panel connections. 8 watts continuous, 15 watts peak into 8 ohms. THD 0.5% @ 25 °C at 1 watt each output. Can drive 4 ohm speaker with reduced performance.
External frequency response	20 Hz to 20 kHz ±2 dB
Input crosstalk	75 dB min.
Channel crosstalk	45 dB min.
Hum and Noise	Less than 3 mV @ 25 °C, maximum volume
Environmental	
Operating temperature	0 °C to 50 °C
Storage temperature	-50 °C to 75 °C
Humidity	0 – 90% (non-condensing)
Power	
Requirements	50 or 60 Hz AC; nominal 100, 110, 120, 200, 220, or 240 VAC ±10%, internally selectable
Consumption	40 watt average; 120 watt peak
Connection	Non-detachable 3-wire cord
Mechanical	
Dimensions	Height: 3.5” (8.9 cm) 2 rack units Width: 19.0” (48.26 cm) Depth: 11.0” (27.94 cm) Incl. Knobs & connectors
Weight	14.5 lbs. (6.57 kg)
Magnetic shielding	Can place next to waveform or picture monitor without interference

Operations

Refer to Figures 7.2 and 7.3 showing the front and rear panels of the APM-800 monitor to understand the operation instructions described below. On the front panel of the APM-800, the square green LED indicates when power is being applied to the unit. There are two eight-position selector switches on the front panel that select the sources to be monitored. Because input signals can vary in strength, a four-position sensitivity selector switch is provided to match the level of the source to the APM-800 meters and amplifiers.

The audio inputs from the A channel selection, the B channel selection, and the sensitivity selection are distributed to the meters, the line output connections, and

to the amplifier section. When set in the stereo position (out), the stereo-mono mode selector switch on the front panel distributes the audio signal from the A input channel to:

- Internal speaker channel A;
- External amplifier channel A; and
- Left headphone.

A similar distribution of the B input channel to B "outputs" occurs. When set in the mono position (in), the stereo-mono mode selector switch combines the two input channels together and send the composite signal to both channel amplifiers.

The balance control on the front panel serves two functions. In the stereo mode, it is a balance control affecting all sound outputs. In the mono mode, it serves as a mix control between the A channel and B channel inputs. The mixed sources are sent to all sound outputs.

The APM-800 has two LED bargraph meters mounted vertically on the front panel of the unit. These meters indicate the level of the selected input signal, and are not affected by the stereo-mono control, balance control, or the volume controls. The meter response selector switch mounted below the meters selects peak or average response for the meters. Peak response is calibrated to give the same reading on the meters as the reading for an average response for a steady 1 KHz sinewave. The meters display standard VU segments in two colors: -20, -10, -7, -5, -3, -1, 0 in green; and +1, +2, +3 in red. Accuracy is ±0.5 dB at 0 dB indication @25 °C, as scaled by the sensitivity switch.

The external volume control sets the level for the amplifiers that feed the external speaker connections on the rear panel of the APM-800. The internal volume control sets the level for the front panel speakers, or for the headphones.

A ¼ inch stereo headphone jack is provided on the front panel of the monitor. It is designed to disconnect the internal speakers when it is plugged in for use.

Performance Tests

The tests described below can be performed to check the performance of the APM-800 monitor. For these tests you need the following equipment:

- Oscilloscope – Tektronix 465 or equivalent;
- AC voltmeter/dB meter – Hewlett-Packard Model 400E, Fluke 8050A, or equivalent;
- Low-Distortion audio oscillator – Potomac AG51, Hewlett-Packard Model 200CD, or equivalent;
- Ohmmeter;

- Sound level meter;
- Audio analyzer – Potomac AA51, or equivalent;
- 600 ohm resistor; and
- Headphone test plug – two 8 ohm resistors for headphone outputs on a headphone jack.

Input Terminating Resistors

To perform a check of the input terminating switches, complete the following steps.

1. Place all of the terminator switches (S200 on the rear panel) in the "on" or up position.
2. Use an ohmmeter to check between the H and L terminals of each of the eight inputs. Each should read between 595 and 615 ohms.
3. With the terminator switches "off", the DC resistance should be over 10 meg ohms.

Input Switching and Sensitivity

To measure the input switching and sensitivity functions, follow the steps below:

1. Apply a 0 dBu signal to one input at a time, starting with input 1.
2. Connect a dB meter and oscilloscope to the line outputs. Set the sensitivity switch to 0 dB and A & B selector switches to 1. Check the outputs for 0 dBu ± 0.1 dB.
3. Move the input and selector switches to input 2; perform the same test as in steps 1 & 2. Repeat this operation for the remainder of the eight input selections.
4. While on one of the inputs, change the sensitivity switch selection to its other settings, and check the line outputs for:
   - -10 dB sensitivity should read +10 dBu ± 0.2 dB on the meter;
   - +4 dB sensitivity should read –4 dBu ± 0.2 dB on the meter; and
   - +8 dB sensitivity should read –8 dBu ± 0.02 dB on the meter.

Maximum Input

To test for maximum input signal, follow the steps below:

1. With the sensitivity switch set at +8 dB, apply a +20 dBu signal to one of the inputs.
2. Connect an oscilloscope and dB meter to the line outputs.

3. Set A & B channels to the selected input, and check the line outputs for +12 dBu and no clipping.
4. Raise the external volume ¼ turn away from full counter-clockwise (CCW) rotation, and check the positive (+) external speaker connection with the oscilloscope for signal without clipping.

Tone Output

To perform a test of the tone output, follow the steps below:

1. Connect a 600 ohm resistor between the H & L terminals of the tone output on the rear panel of the monitor.
2. Connect the dB meter across the 600 ohm resistor. Confirm that the tone signal level is +4 dBu ± 0.2 dB. If not, make the adjustment by turning R560 (located in the upper right corner of the rear circuit board inside the APM-800 monitor).
3. Connect an oscilloscope from ground to the H terminal of the tone output. It should read 1 kHz ± 5%.

4	Both the H and L terminals are outputs driven with respect to electrical ground. Do not short H or L of the tone output to ground.

Speaker Pressure Level

To measure the pressure level of the internal speakers, follow the steps below:

1. Make sure the cover to the APM-800 monitor is on. Apply a 1 kHz, 1.3 dBu signal to input 5 on the rear panel of the monitor.
2. Set selector switches A & B to 5. Set sensitivity selection to +0 dB. Set the internal volume control to maximum.
3. Hold a sound meter two feet (about 60 cm) in front of the APM-800, and observe the reading. After the measurement, make sure that you lower the internal volume control.

Headphone Output

To test the outputs of the headphone, follow the steps below:

1. Set the APM-800 sensitivity selector switch to 0 dB.
2. Using the same input signal as in the speaker pressure level test above, adjust the input level to +4dBu and connect the headphone test plug.
3. Connect the oscilloscope and the AC voltmeter to one of the headphone output load resistors.
4. Raise the internal volume control to a point just before the signal waveform begins to clip on the oscilloscope display.
5. Check the AC voltage reading on the voltmeter. It should read 260 mV rms. Repeat the measurement for the other headphone output.

6. After the measurement, lower the internal volume and remove the headphone test plug.

External Speaker Amplifiers

To test the external speaker amplifiers, follow the steps below:

1. Connect 8 ohm, 20 W load resistors to the external speaker connections on the rear panel of the APM-800.
2. Make sure that the AC line voltage being applied to the APM-800 is at its nominal level.
3. Apply a +4dBu signal to one of the inputs, and set 0 dB on the sensitivity selector switch on the front panel of the unit.
4. Raise the external volume control until there is 9.4 V rms across each 8 ohm load resistor. Adjust the balance control if necessary. Check both channels with the oscilloscope to make sure that there is no clipping of the waveform.
5. After the test is completed, lower the external volume control.

Total Harmonic Distortion

To measure the total harmonic distortion (THD) of the input signal, follow the steps below:

1. Connect a low distortion source to input 5 of the APM-800. Apply a 0 dBu signal level at 1 kHz frequency.
2. Connect an audio analyzer to one channel of the 8 ohm external loads.
3. Adjust the external volume until the output level reads 2.8 V rms.
4. Switch to tune on the audio analyzer and adjust the frequency of the source until the analyzer reads null on its meter (exactly 1 kHz).
5. Switch to THD on the audio analyzer, set approximately 1% on the scale setting, and observe the reading. Repeat this procedure for the other channel

Meter Tracking

To check the sensitivity tracking of the LED meters, follow the steps below:

1. Set the sensitivity selector switch to 0 dB, and apply a 1 kHz signal to one of the inputs, for example input 5.
2. Connect the dB meter across the input terminals. Measure the input level that just turns on the first LED segment (-20dBu ± 3dB) of meters A and B, for both peak program and average response modes.
3. Raise the input level and measure for the fourth LED segment (-5dBu ± 1dB); raise again and measure for the seventh LED segment (0dBu ± 0.5dB); raise again and measure for the tenth LED segment (+3dBu ± 1dB).

Meter Frequency Response

To measure the meter frequency response, follow the steps below:

1. Set the sensitivity selector switch to 0 dB, and apply a 1 kHz signal to one of the inputs, for example input 5.
2. Connect the Fluke 8050A meter across the input terminals.
3. With the A meter on the front panel of the monitor set in average mode, adjust the input level of the source until the seventh (7) LED segment of the A meter just turns on.
4. Set the "relative" switch on the Fluke 8050A meter monitoring the input.
5. Change the source signal frequency to 30 Hz, and adjust the input level until the seventh LED segment of the A meter just turns on. Record the reading of the Fluke 8050A meter.
6. Change the input frequency to 30 kHz, and adjust the input level until the seventh LED segment of the A meter just turns on. Record the reading of the fluke 8050A meter.
7. Repeat this procedure for the A meter set in peak mode.
8. Repeat the entire procedure for the B meter.

4	Be sure to set the "relative" switch on the Fluke 8050A meter for an input frequency of 1 kHz for all measurements.